Antarctic Meteorite Newsletter

Volume 24, Number 2 September 2001

A periodical issued by the Meteorite Working Group to inform scientists of the basic characteristics of specimens recovered in the Antarctic.

Edited by Cecilia Satterwhite and David Mittlefehldt, NASA Johnson Space Center.

Inside this Issue

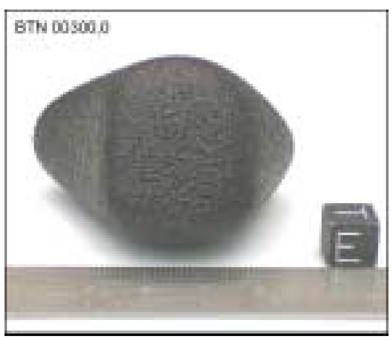
Program News

New Meteorites

Dave Mittlefehldt

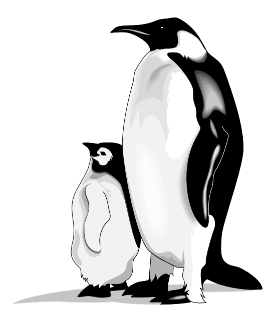
This newsletter contains classifications for 287 meteorites. Most (262) are for meteorites in the 1999 ANSMET collection that were taken from the Queen Alexandra Range area, but we also have classifications for the first samples from the 2000 field season, which were taken from Meteorite Hills (24), and one for a sample from Bates Nunataks that appears incredibly fresh (see figure). In fact, it looks so fresh that we decided to count it in the JSC low-level gamma-ray counting facility on the off chance that short-lived cosmogenic radionuclides were still present. We didn't detect any.

For meteorites in the 2000 collection, we are announcing several CM2 chondrites, a CR2 chondrite, several diogenites (some unusual), a eucrite, two howardites, and a plethora of ordinary chondrites. As you might guess, most of the QUE meteorites classified here are LL5 chondrites (181). However, we have also turned up other ordinary chondrites; a small diogenite; a small eucrite; a CR2 chondrite; and an ungrouped chondrite, possibly paired with QUE 94411. In addition, we have three meteorites that are probably paired with QUE 99059 and friends. Avid readers of this newsletter will remember that QUE 99059 brought a classification problem to my attention because it was tentatively paired with three other meteorites that were listed under two different classifications. Based on one opinion contained in a lengthy e-mail, we now classify all seven of these meteorites as "Enstatite Meteorite, Ungrouped." These are clearly unusual meteorites that deserve detailed study. Descriptions are given here for 19 meteorites of special petrologic type.



The newsletter was in press when we received descriptions of several irons from T. McCoy; we added them. Although 26 individuals are listed, these likely represent three different meteorites. Two individuals have been added to the Derrick Peak pairing group, and 24 individuals were recovered from the Meteorite Hills area. One is a meteorite of unusual type represented by a single, small individual. The remaining 23 individuals are tentatively classified as IIIAB and appear to represent a single fall, which may have been recent. The irons were found in what is plausibly part of a strewn field. More details about this are on our Web site at <http://curator.jsc.nasa.gov/curator/antmet/amn/amnsep01/MeteoriteHills.htm>.

More Program News on page 2.



Sample Request Deadline September 28, 2001

MWG Meets October 5-6, 2001

Plans for the 2000–2001 Field Season

Ralph Harvey

Bear with me on this one. Most of you are aware of the famous Chinese blessing that doubles as a curse: "May you live in interesting times." What you may not know, however, is that this statement is not really Chinese; it's reportedly the first of three progressively more awful curses occurring in the fictional China of Ernest Bramah's *The Wallet of Kai Lung* (1900). The lesser-known (but equally intriguing) second and third curses from that work are "May you come to the attention of those in high places" and "May the Gods grant your prayers." Ironically, these blessings together do a good job of portraying the planning progress for the 2001–2002 field season.

For about a year now, NASA has been working with ANSMET and the National Science Foundation to see if we can support a second field party that would increase the overall recovery rate of Antarctic meteorites and thus increase the recovery rate for Martian meteorites. The rationale for this, of course, is last year's reorganization of the NASA Mars Exploration Program, which postponed plans for the return of Mars samples into the next decade.

For ANSMET, which has seen diminishing budgets over the past decade, this is the proverbial "answer to our prayers." But, despite the fact that it's an offer we can't really refuse, making this second field team a reality has been, as the *faux* Chinese curse suggests, "interesting."

As of this writing, we are planning two field parties: a group of eight that will continue the work at Meteorite Hills we began last year and a group of four that will perform high-level reconnaissance at a number of ice fields in the region immediately south of the Queen Alexandra Mountains. This group will have a high level of aircraft support, which will minimize travel time and cargo needs and allow the group to make significant recoveries from a number of poorly known sites. The hope is that this combined strategy of systematic recovery from known sites and exploratory high-grading of new sites will result in the discovery of significant new meteorite stranding surfaces and the recovery of a few new Martians in the process.

Right now, part of the money needed to create this second field party is in hand: funds to hire a second mountain guide and a postdoctoral researcher who will serve as a scientific "first officer" and to cover medical, dental, and travel costs for the additional volunteers. Major logistical support needs were estimated in a proposal to NASA, but as of this writing, these are still in the approval process. In the event that logistical support simply can't be provided this year, we'll send the party of eight to Meteorite Hills and try to keep our momentum up for a two-party field season next year.

One last thing—this year marks mountaineer John "Johnny Alpine" Schutt's 21st field season with ANSMET and ANSMET's 25th season overall. Please join me in honoring John Schutt's contribution; we hope to have a special slide show dedicated to John and a celebratory dinner when we host the Antarctic meteorite slide show this year. Thanks to all of you for your continued support.

Program News continued from page 1.

JSC Laboratory Renovations

Facility upgrades continue. We appear to be in the final stages of upgrading the air handler system in the Meteorite Processing Laboratory (MPL)—work that was scheduled for completion in July. Once the upgrade work is completed, the lab will be completely cleaned before we start new processing work. We sincerely hope to be up and running by mid-September.

ELECTRONIC SAMPLE REQUEST FORM AVAILABLE ONLINE

The Meteorite Working Group (MWG) is developing an electronic form for requesting Antarctic meteorite samples. A test version of the form and instructions for its use are available as a Word document at <http://curator.jsc.nasa.gov/curator/antmet/samreq.htm>. Please use this form when requesting samples. The form is intended to ensure that the MWG obtains all information needed to make an informed decision about the request.

Suggestions for improving the form can be sent to Dave Mittlefehldt at the e-mail address on page 23 of this newsletter. Please note that the form has signature blocks. These should be used only if the form is sent via fax or postal service.

We prefer that requests be sent by e-mail.

New Meteorites

From the 1999 and 2000 Collections

Pages 13–20 contain preliminary descriptions and classifications that were completed after the publication of issue 24(1), February 2001. Specimens of special petrologic type (e.g., carbonaceous chondrite, unequilibrated ordinary chondrite, and achondrite) are described separately unless they are paired with previously described meteorites. However, some specimens that are not of special petrologic type are listed only as single-line entries in Table 1. For convenience, new specimens of special petrologic type are recast in Table 2.

Macroscopic examinations of stony meteorites were performed at the NASA Lyndon B. Johnson Space Center. These descriptions summarize hand-specimen features observed during the initial examination. Classification is based on microscopic petrography and reconnaissance-level electron microprobe analyses of polished sections prepared from a small chip of each meteorite. For each stony meteorite, the sample number assigned to the section studied in the preliminary examination is included. In some cases, however, a single microscopic description is based on thin sections of several specimens believed to be members of a single fall.

Meteorite descriptions contained in this issue were contributed by the following individuals:

Kathleen McBride, Cecilia Satterwhite
Antarctic Meteorite Laboratory
NASA Johnson Space Center
Houston, Texas

Tim McCoy, Linda Welzenbach, Gretchen Benedix
Department of Mineral Sciences
U.S. National Museum of Natural History
Smithsonian Institution
Washington, D.C.

Antarctic Meteorite Locations

ALH — Allan Hills
BEC — Beckett Nunatak
BOW — Bowden Neve
BTN — Bates Nunataks
DAV — David Glacier
DEW — Mt. DeWitt
DOM — Dominion Range
DRP — Derrick Peak
EET — Elephant Moraine
FIN — Finger Ridge
GDR — Gardner Ridge
GEO — Geologists Range
GRA — Graves Nunataks
GRO — Grosvenor Mountains
HOW — Mt. Howe
ILD — Inland Forts
KLE — Klein Ice Field
LAP — LaPaz Ice Field
LEW — Lewis Cliff
LON — Lonewolf Nunataks
MAC — MacAlpine Hills
MBR — Mount Baldr
MCY — MacKay Glacier
MET — Meteorite Hills
MIL — Miller Range
OTT — Outpost Nunatak
PAT — Patuxent Range
PCA — Pecora Escarpment
PGP — Purgatory Peak
PRE — Mt. Prestrud
QUE — Queen Alexandra Range
RKP — Reckling Peak
SCO — Scott Glacier
STE — Stewart Hills
TEN — Tentacle Ridge
TIL — Thiel Mountains
TYR — Taylor Glacier
WIS — Wisconsin Range
WSG — Mt. Wisting

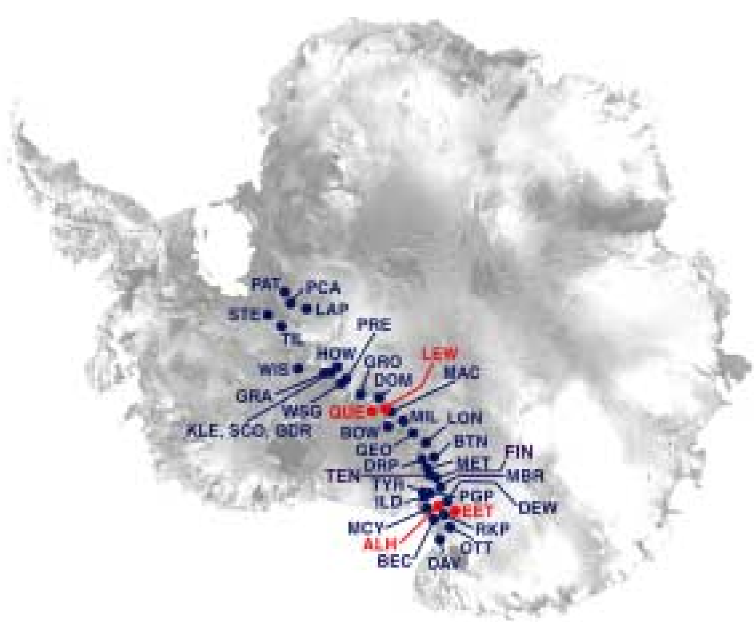


Table 1

List of Newly Classified Antarctic Meteorites**

Sample Number	Weight (g)	Classification	Weathering	Fracturing	% Fa	% Fs
QUE 99 013~	814.2	L5 CHONDRITE	C	B		
QUE 99 016~	2166.4	LL5 CHONDRITE	B	B		
QUE 99 017~	4999.0	LL5 CHONDRITE	B	A/B		
QUE 99 023~	1933.0	H5 CHONDRITE	C	A		
QUE 99 024	2074.0	H6 CHONDRITE	B	B	18	15
QUE 99 025~	747.2	LL5 CHONDRITE	B/C	A/B		
QUE 99 031~	189.1	H5 CHONDRITE	C	C		
QUE 99 032~	214.1	L5 CHONDRITE	B/C	B		
QUE 99 034~	198.3	L6 CHONDRITE	B/C	A/B		
QUE 99 035~	57.8	LL5 CHONDRITE	B	A/B		
QUE 99 036~	45.5	LL5 CHONDRITE	B	B		
QUE 99 037~	101.9	L5 CHONDRITE	B	A/B		
QUE 99 039~	244.1	L5 CHONDRITE	B/C	B		
QUE 99 089	584.6	L4 CHONDRITE	B	B/C	25	21
QUE 99 090~	235.9	L5 CHONDRITE	B	A/B		
QUE 99 091~	356.8	LL5 CHONDRITE	B	A/B		
QUE 99 092~	230.0	L5 CHONDRITE	B	A/B		
QUE 99 093~	336.1	LL5 CHONDRITE	B	A/B		
QUE 99 094	329.3	H5 CHONDRITE	B	A	20	17
QUE 99 095~	525.9	L5 CHONDRITE	B	A/B		
QUE 99 096~	1029.2	H6 CHONDRITE	C	B/C		
QUE 99 097~	463.0	LL6 CHONDRITE	A/B	A/B		
QUE 99 098	755.5	H4 CHONDRITE	B	B	18	8-15
QUE 99 099	173.6	H5 CHONDRITE	B	A/B	18	15
QUE 99 110~	7.5	LL5 CHONDRITE	A	A/B		
QUE 99 111~	1.9	LL5 CHONDRITE	A	A/B		
QUE 99 112~	23.2	LL5 CHONDRITE	A	A/B		
QUE 99 113	0.6	CM2 CHONDRITE	A	A/B	2-13	2-12
QUE 99 114~	29.9	LL5 CHONDRITE	C	B		
QUE 99 115~	1.2	LL5 CHONDRITE	B	A		
QUE 99 116~	30.8	LL5 CHONDRITE	B	A/B		
QUE 99 117~	21.3	LL5 CHONDRITE	B	A/B		
QUE 99 118~	93.9	L5 CHONDRITE	C	A/B		
QUE 99 119~	56.9	H5 CHONDRITE	C	B		
QUE 99 120~	7.8	LL5 CHONDRITE	B/C	B		
QUE 99 121~	22.6	L5 CHONDRITE	B/C	B		
QUE 99 122	19.9	ENSTATITE METEORITE UNG	C	C		0-1
QUE 99 123~	5.4	LL5 CHONDRITE	B	B		
QUE 99 124~	23.0	L4 CHONDRITE	B/C	A/B		
QUE 99 125	54.6	L5 CHONDRITE	C	B	25	21
QUE 99 126~	14.7	LL5 CHONDRITE	B	B		
QUE 99 127~	8.4	LL5 CHONDRITE	B	B		
QUE 99 128~	20.5	L5 CHONDRITE	C	B		
QUE 99 129~	0.5	LL5 CHONDRITE	B	B		
QUE 99 130~	13.9	LL5 CHONDRITE	A/B	A/B		
QUE 99 131~	4.7	LL5 CHONDRITE	B	A/B		
QUE 99 132~	1.5	LL5 CHONDRITE	B	A/B		
QUE 99 133~	5.0	LL5 CHONDRITE	B	A/B		

~ Classified by using refractive indices.

Sample Number	Weight (g)	Classification	Weathering	Fracturing	% Fa	% Fs
QUE 99 134	0.4	METAL	A/B	A/B	25	23
QUE 99 135~	2.7	LL5 CHONDRITE	C	A/B		
QUE 99 136~	3.5	LL5 CHONDRITE	B	A/B		
QUE 99 137~	5.9	LL5 CHONDRITE	B/C	B		
QUE 99 138~	1.0	LL5 CHONDRITE	B	A/B		
QUE 99 139~	4.2	LL5 CHONDRITE	B/C	A/B		
QUE 99 140~	1.0	LL5 CHONDRITE	B	B		
QUE 99 141~	3.1	LL5 CHONDRITE	B	B		
QUE 99 142~	0.3	LL5 CHONDRITE	A/B	A/B		
QUE 99 143~	1.6	LL5 CHONDRITE	B	B		
QUE 99 144~	20.0	LL5 CHONDRITE	A/B	A/B		
QUE 99 145	2.0	L5 CHONDRITE	C	B	24	20
QUE 99 146~	7.5	LL5 CHONDRITE	A/B	B		
QUE 99 147~	5.5	LL5 CHONDRITE	A/B	B		
QUE 99 148	21.8	H6 CHONDRITE	C	B	19	17
QUE 99 149~	1.3	LL5 CHONDRITE	B	B		
QUE 99 150~	0.4	LL5 CHONDRITE	B	B		
QUE 99 151	2.8	LL5 CHONDRITE	B/C	B	27	22
QUE 99 152~	15.7	LL5 CHONDRITE	B	B		
QUE 99 153~	6.0	LL5 CHONDRITE	B	B		
QUE 99 154~	3.4	LL5 CHONDRITE	B	B		
QUE 99 155~	2.2	LL5 CHONDRITE	B	B		
QUE 99 156~	3.0	LL5 CHONDRITE	B	B		
QUE 99 157	10.7	ENSTATITE METEORITE UNG	C	C		0-1
QUE 99 158	31.0	ENSTATITE METEORITE UNG	C	C		0-1
QUE 99 159~	2.4	L5 CHONDRITE	C	A/B		
QUE 99 160~	16.4	LL5 CHONDRITE	B/C	B		
QUE 99 161~	3.8	L5 CHONDRITE	B	B		
QUE 99 162	1.0	H5 CHONDRITE	C	A/B	19	16
QUE 99 163~	4.4	LL5 CHONDRITE	B	B		
QUE 99 164~	0.7	LL5 CHONDRITE	B	B		
QUE 99 165~	25.9	LL5 CHONDRITE	B	B		
QUE 99 166~	20.0	LL5 CHONDRITE	B	B		
QUE 99 167~	1.9	LL5 CHONDRITE	B	B		
QUE 99 168~	6.1	LL5 CHONDRITE	B	B		
QUE 99 169~	2.5	LL5 CHONDRITE	B	B		
QUE 99 170~	23.6	LL5 CHONDRITE	B	B		
QUE 99 171~	19.3	LL5 CHONDRITE	B	B		
QUE 99 172~	24.7	LL5 CHONDRITE	A/B	A/B		
QUE 99 174~	39.3	L5 CHONDRITE	B/C	B		
QUE 99 175~	63.3	L5 CHONDRITE	B/C	B		
QUE 99 176~	27.4	LL5 CHONDRITE	B	B		
QUE 99 177	43.6	CR2 CHONDRITE	BE	B	1-31	1-7
QUE 99 178~	19.4	LL5 CHONDRITE	B	B		
QUE 99 179~	41.0	L5 CHONDRITE	C	B		
QUE 99 180~	6.0	LL5 CHONDRITE	B	B		
QUE 99 181~	1.7	LL5 CHONDRITE	B	B		
QUE 99 182~	10.7	LL5 CHONDRITE	B	B		
QUE 99 183~	10.2	LL5 CHONDRITE	B	B		
QUE 99 184~	5.1	LL5 CHONDRITE	B	B		
QUE 99 185~	0.5	LL5 CHONDRITE	B	B		
QUE 99 186~	3.7	L5 CHONDRITE	C	B		
QUE 99 187~	2.0	LL6 CHONDRITE	C	B		

~ Classified by using refractive indices.

Sample Number	Weight (g)	Classification	Weathering	Fracturing	% Fa	% Fs
QUE 99 188~	0.5	LL5 CHONDRITE	B/C	B		
QUE 99 189~	1.7	LL5 CHONDRITE	B	B		
QUE 99 190~	123.3	L5 CHONDRITE	B/C	B		
QUE 99 191~	100.0	L6 CHONDRITE	B/C	A/B		
QUE 99 192	139.3	H5 CHONDRITE	C	B	19	17
QUE 99 193	181.6	H5 CHONDRITE	B/C	A/B	19	17
QUE 99 194~	205.8	L5 CHONDRITE	C	A/B		
QUE 99 195	234.7	H6 CHONDRITE	C	C	20	17
QUE 99 196~	77.6	LL5 CHONDRITE	B	A/B		
QUE 99 197~	24.8	H6 CHONDRITE	C	A/B		
QUE 99 198	36.9	H5 CHONDRITE	C	B	19	16
QUE 99 199~	30.2	LL5 CHONDRITE	B	A/B		
QUE 99 200~	1.1	LL5 CHONDRITE	B	B		
QUE 99 201~	0.2	LL5 CHONDRITE	B	B		
QUE 99 202~	1.9	L5 CHONDRITE	C	B		
QUE 99 203	2.0	H5 CHONDRITE	C	B	20	17
QUE 99 204~	26.7	LL5 CHONDRITE	B	B		
QUE 99 205~	1.1	LL5 CHONDRITE	B/C	B		
QUE 99 206~	1.7	LL5 CHONDRITE	C	B		
QUE 99 207~	0.7	LL5 CHONDRITE	B	B		
QUE 99 208~	3.8	LL5 CHONDRITE	B	B		
QUE 99 209~	1.2	LL5 CHONDRITE	C	B		
QUE 99 210~	8.6	LL5 CHONDRITE	B	B		
QUE 99 211~	0.5	LL5 CHONDRITE	B	B		
QUE 99 212~	8.7	LL5 CHONDRITE	B	A/B		
QUE 99 213~	1.2	LL5 CHONDRITE	B	B		
QUE 99 214~	1.2	LL5 CHONDRITE	B	B		
QUE 99 215~	0.2	LL5 CHONDRITE	B/C	A/B		
QUE 99 216~	1.9	LL5 CHONDRITE	B/C	A/B		
QUE 99 217~	3.4	LL5 CHONDRITE	B	A/B		
QUE 99 218~	0.3	LL5 CHONDRITE	B	B		
QUE 99 219~	0.4	LL5 CHONDRITE	B	B		
QUE 99 220~	16.1	LL5 CHONDRITE	A/B	A/B		
QUE 99 221~	8.9	LL5 CHONDRITE	B	A/B		
QUE 99 222~	9.6	LL5 CHONDRITE	B	B		
QUE 99 223~	0.6	LL5 CHONDRITE	B/C	B		
QUE 99 224~	2.2	LL5 CHONDRITE	B/C	B		
QUE 99 225~	0.3	LL5 CHONDRITE	B/C	A/B		
QUE 99 226~	0.6	LL5 CHONDRITE	B	B		
QUE 99 227~	0.5	LL5 CHONDRITE	B	B		
QUE 99 228~	0.5	LL5 CHONDRITE	B	B		
QUE 99 229~	0.8	LL5 CHONDRITE	B	B		
QUE 99 230	8.1	H6 CHONDRITE	C	B	19	16
QUE 99 231	1.5	DIOGENITE	A	A/B		20
QUE 99 232~	1.5	LL5 CHONDRITE	B	B		
QUE 99 233~	0.8	LL5 CHONDRITE	B	B		
QUE 99 234~	2.4	LL5 CHONDRITE	B	B		
QUE 99 235~	6.1	H5 CHONDRITE	C	B		
QUE 99 236~	0.9	H5 CHONDRITE	C	A/B		
QUE 99 237~	2.3	LL6 CHONDRITE	B	B		
QUE 99 238~	2.4	LL5 CHONDRITE	B/C	B		
QUE 99 239~	18.4	L5 CHONDRITE	B	A/B		
QUE 99 240~	13.0	LL5 CHONDRITE	B/C	B		

~ Classified by using refractive indices.

Sample Number	Weight (g)	Classification	Weathering	Fracturing	% Fa	% Fs
QUE 99 241~	3.2	LL5 CHONDRITE	A	A		
QUE 99 242~	1.5	LL5 CHONDRITE	B	B		
QUE 99 243~	6.8	LL5 CHONDRITE	B	B		
QUE 99 244~	21.2	LL5 CHONDRITE	A/B	A/B		
QUE 99 245~	32.6	LL5 CHONDRITE	B/C	B		
QUE 99 246~	36.0	H6 CHONDRITE	C	B		
QUE 99 247~	42.0	H6 CHONDRITE	C	B		
QUE 99 248~	14.4	LL5 CHONDRITE	A/B	A/B		
QUE 99 249~	1.8	LL5 CHONDRITE	B	B		
QUE 99 250~	6.2	LL5 CHONDRITE	B	A/B		
QUE 99 251~	17.5	LL5 CHONDRITE	A/B	A/B		
QUE 99 252~	0.3	LL5 CHONDRITE	B/C	A/B		
QUE 99 253~	0.3	LL5 CHONDRITE	B/C	B		
QUE 99 254~	0.3	H5 CHONDRITE	C	B		
QUE 99 255~	1.0	LL5 CHONDRITE	B	B		
QUE 99 256~	0.8	LL5 CHONDRITE	B	B		
QUE 99 257~	4.1	LL5 CHONDRITE	B	B		
QUE 99 258~	1.6	LL5 CHONDRITE	A/B	A/B		
QUE 99 259~	1.2	LL6 CHONDRITE	B/C	B		
QUE 99 260~	4.6	LL5 CHONDRITE	B	B		
QUE 99 261~	2.8	LL5 CHONDRITE	B	B		
QUE 99 262~	4.1	LL5 CHONDRITE	B	B		
QUE 99 263~	3.8	LL5 CHONDRITE	B/C	B		
QUE 99 264~	10.9	L5 CHONDRITE	C	B		
QUE 99 265~	7.0	LL5 CHONDRITE	B	B		
QUE 99 266~	0.7	LL5 CHONDRITE	B	B		
QUE 99 267~	4.6	LL5 CHONDRITE	B	B		
QUE 99 268~	1.4	LL5 CHONDRITE	B	B		
QUE 99 269~	1.6	LL5 CHONDRITE	B/C	B		
QUE 99 270~	1.5	LL5 CHONDRITE	B	B		
QUE 99 271~	1.8	LL5 CHONDRITE	B	B		
QUE 99 272~	2.7	LL5 CHONDRITE	B	B		
QUE 99 273~	5.6	LL5 CHONDRITE	B	B		
QUE 99 274~	1.7	LL5 CHONDRITE	B	B		
QUE 99 275~	9.8	LL5 CHONDRITE	B	B		
QUE 99 276~	6.4	LL5 CHONDRITE	C	B		
QUE 99 277~	1.8	LL5 CHONDRITE	B	C		
QUE 99 278~	7.9	LL5 CHONDRITE	C	B/C		
QUE 99 279~	7.1	LL5 CHONDRITE	B/C	B		
QUE 99 280~	0.6	LL5 CHONDRITE	B	B		
QUE 99 281~	1.5	LL5 CHONDRITE	B/C	B		
QUE 99 282~	18.5	LL5 CHONDRITE	B/C	B		
QUE 99 283~	2.2	LL5 CHONDRITE	B/C	B		
QUE 99 284~	2.8	LL5 CHONDRITE	B	B		
QUE 99 285~	11.5	LL5 CHONDRITE	A/B	A/B		
QUE 99 286~	1.9	LL5 CHONDRITE	B	A/B		
QUE 99 287~	9.3	LL5 CHONDRITE	A/B	A/B		
QUE 99 288~	3.0	LL5 CHONDRITE	B/C	B		
QUE 99 290~	2.9	LL5 CHONDRITE	B	B		
QUE 99 291~	5.2	LL5 CHONDRITE	B	B		
QUE 99 292~	3.8	LL5 CHONDRITE	B	B		
QUE 99 293~	1.8	LL5 CHONDRITE	B	B		
QUE 99 294~	0.3	L5 CHONDRITE	C	B		

~ Classified by using refractive indices.

Sample Number	Weight (g)	Classification	Weathering	Fracturing	% Fa	% Fs
QUE 99 295~	0.3	LL5 CHONDRITE	B	B		
QUE 99 296~	2.7	LL5 CHONDRITE	B	B		
QUE 99 297~	2.0	LL5 CHONDRITE	C	B		
QUE 99 298~	0.7	LL5 CHONDRITE	C	B		
QUE 99 299~	1.8	LL5 CHONDRITE	B	B		
QUE 99 300~	0.6	LL5 CHONDRITE	B	A		
QUE 99 301~	10.0	H6 CHONDRITE	C	B		
QUE 99 302~	0.6	LL5 CHONDRITE	B/C	A		
QUE 99 303~	3.7	LL5 CHONDRITE	B/C	B		
QUE 99 304~	0.5	H6 CHONDRITE	C	A/B		
QUE 99 305~	17.4	LL5 CHONDRITE	B/C	B		
QUE 99 306~	1.8	LL5 CHONDRITE	B/C	B		
QUE 99 307~	13.8	H6 CHONDRITE	C	B		
QUE 99 308~	7.5	H6 CHONDRITE	C	A/B		
QUE 99 309	1.7	CHONDRITE UNGROUPED	C	B	3-4	1
QUE 99 310~	25.3	H6 CHONDRITE	C	B		
QUE 99 311~	98.3	H5 CHONDRITE	C	B		
QUE 99 312~	101.7	L5 CHONDRITE	C	B		
QUE 99 313~	103.9	LL5 CHONDRITE	C	B		
QUE 99 314~	101.2	L5 CHONDRITE	B	B		
QUE 99 315~	142.3	LL5 CHONDRITE	A/B	A		
QUE 99 316~	104.0	LL5 CHONDRITE	B	A/B		
QUE 99 317~	145.0	LL5 CHONDRITE	B	A/B		
QUE 99 318~	90.0	H5 CHONDRITE	C	B		
QUE 99 319~	77.9	H5 CHONDRITE	C	B		
QUE 99 320~	17.8	LL5 CHONDRITE	B	B		
QUE 99 321~	23.7	LL5 CHONDRITE	A/B	A/B		
QUE 99 322~	35.7	H6 CHONDRITE	C	A/B		
QUE 99 323~	47.5	LL5 CHONDRITE	A/B	A/B		
QUE 99 324~	16.3	H6 CHONDRITE	C	B		
QUE 99 325~	52.4	LL5 CHONDRITE	A/B	A/B		
QUE 99 326~	21.6	H6 CHONDRITE	C	B		
QUE 99 327	29.7	L4 CHONDRITE	C	B	23	19
QUE 99 328~	25.7	LL5 CHONDRITE	C	A/B		
QUE 99 329~	19.6	H6 CHONDRITE	C	A/B		
QUE 99 330~	11.7	LL6 CHONDRITE	B	B		
QUE 99 331	7.0	L4 CHONDRITE	C	B	22	10-18
QUE 99 332~	8.7	LL5 CHONDRITE	B	B		
QUE 99 333~	6.2	LL5 CHONDRITE	B	B		
QUE 99 334~	1.4	LL5 CHONDRITE	B	B		
QUE 99 335~	1.1	LL5 CHONDRITE	B/C	B		
QUE 99 336~	6.7	LL5 CHONDRITE	B	B		
QUE 99 337~	1.8	LL5 CHONDRITE	B	B		
QUE 99 338~	1.4	LL5 CHONDRITE	B/C	B		
QUE 99 339~	17.1	LL5 CHONDRITE	B	B		
QUE 99 790~	8.9	LL5 CHONDRITE	B	B		
QUE 99 791~	9.6	LL5 CHONDRITE	B	B		
QUE 99 792~	9.2	LL5 CHONDRITE	B/C	B		
QUE 99 793~	1.8	LL5 CHONDRITE	B/C	B		
QUE 99 794~	1.1	LL5 CHONDRITE	B/C	B		
QUE 99 795~	2.8	LL5 CHONDRITE	B	B		
QUE 99 796~	3.8	LL5 CHONDRITE	B/C	B		
QUE 99 797~	1.1	L5 CHONDRITE	C	B		

~ Classified by using refractive indices.

Sample Number	Weight (g)	Classification	Weathering	Fracturing	% Fa	% Fs
QUE 99 798~	2.7	LL5 CHONDRITE	B	B		
QUE 99 799	8.3	EUCRITE (BRECCIATED)	B	B/C		23-54
BTN 00 300	124.6	EUCRITE (UNBRECCIATED)	A	A		28-49
DRP 00 200	10000.0	IRON-IIAB	B	A		
DRP 00 201	2689.4	IRON-IIAB	B	A		
MET 00 400	4583.8	IRON-IIIAB	B	A		
MET 00 401	205.1	IRON-IIIAB	B	A		
MET 00 402	82.6	IRON-IIIAB	B	A		
MET 00 403	58.5	IRON-IIIAB	B	A		
MET 00 404	20.7	IRON-IIIAB	B	A		
MET 00 405	17.0	IRON-IIIAB	B	A		
MET 00 406	16.1	IRON-IIIAB	B	A		
MET 00 407	5.4	IRON-IIIAB	B	A		
MET 00 408	18.1	IRON-IIIAB	B	A		
MET 00 409	14.0	IRON-IIIAB	B	A		
MET 00 410	3.0	IRON-IIIAB	B	A		
MET 00 411	3.2	IRON-IIIAB	B	A		
MET 00 412	8.7	IRON-IIIAB	B	A		
MET 00 413	3.8	IRON-IIIAB	B	A		
MET 00 414	4.8	IRON-IIIAB	B	A		
MET 00 415	5.2	IRON-IIIAB	B	A		
MET 00 416	4.4	IRON-IIIAB	B	A		
MET 00 417	7.8	IRON-IIIAB	B	A		
MET 00 418	4.8	IRON-IIIAB	B	A		
MET 00 419	9.0	IRON-IIIAB	B	A		
MET 00 420	6.3	IRON-IIIAB	B	A		
MET 00 421	6.7	IRON-IIIAB	B	A		
MET 00 422	201.5	DIOGENITE	A/B	A		22
MET 00 423	79.4	HOWARDITE	A/B	A/B		20-53
MET 00 424	98.9	DIOGENITE	B	A/B	29	27
MET 00 425	118.3	DIOGENITE	B/C	B		15
MET 00 426	31.3	CR2 CHONDRITE	B	B/C	1-32	1-4
MET 00 427	18.6	HOWARDITE	B	A/B		14-41
MET 00 428	45.8	IRON UNGROUPED	B	A		
MET 00 431	23.4	CM2 CHONDRITE	BE	C	0-31	7
MET 00 432	38.9	CM2 CHONDRITE	B	C	0-1	
MET 00 433	10.9	CM2 CHONDRITE	BE	C	0-8	
MET 00 434	6.1	CM2 CHONDRITE	BE	C	0-6	3
MET 00 435	2.4	CM2 CHONDRITE	BE	C	1-21	0-2
MET 00 436	1765.6	DIOGENITE	B/C	B/C		26
MET 00 437	2685.3	L6 CHONDRITE	B/C	B/C	25	21
MET 00 438	3747.4	L6 CHONDRITE	B	A/B	24	19
MET 00 439~	2601.9	LL5 CHONDRITE	A	A		
MET 00 440~	1624.7	L5 CHONDRITE	B/C	B		
MET 00 441	1299.6	L5 CHONDRITE	A/B	A	24	19
MET 00 442	1149.2	H4 CHONDRITE	C	C	20	11-19
MET 00 443~	872.0	L5 CHONDRITE	B/C	C		
MET 00 444~	1469.6	LL6 CHONDRITE	C	B/C		
MET 00 445	1631.5	L5 CHONDRITE	C	C	24	20
MET 00 446~	1181.3	L5 CHONDRITE	B/C	C		

~ Classified by using refractive indices.

Sample Number	Weight (g)	Classification	Weathering	Fracturing	% Fa	% Fs
MET 00 447~	1231.6	L5 CHONDRITE	C	C		
MET 00 448~	1148.7	L5 CHONDRITE	A/B	B		
MET 00 859	33.9	IRON-IIIAB	B	A		

**Notes to Tables 1 and 2

Weathering Categories

A Minor rustiness; rust haloes on metal particles and rust stains along fractures are minor.

B Moderate rustiness; large rust haloes occur on metal particles, and rust stains on internal fractures are extensive.

C Severe rustiness; metal particles have been mostly stained by rust throughout.

E Evaporite minerals are visible to the naked eye.

Fracturing Categories

A Minor cracks; few or no cracks are conspicuous to the naked eye, and no cracks penetrate the entire specimen.

B Moderate cracks; several cracks extend across exterior surfaces, and the specimen can be readily broken along the cracks.

C Severe cracks; specimen readily crumbles along cracks that are both extensive and abundant.

~ Classified by using refractive indices.

Table 2**

Newly Classified Specimens Listed by Type

Sample Number	Weight (g)	Classification	Weathering	Fracturing	% Fa	%Fs
		Achondrites				
QUE 99 231	1.5	DIOGENITE	A	A/B		20
MET 00 422	201.5	DIOGENITE	A/B	A		22
MET 00 424	98.9	DIOGENITE	B	A/B	29	27
MET 00 425	118.3	DIOGENITE	B/C	B		15
MET 00 436	1765.6	DIOGENITE	B/C	B/C		26
QUE 99 122	19.9	ENSTATITE METEORITE UNG	C	C		0-1
QUE 99 157	10.7	ENSTATITE METEORTIE UNG	C	C		0-1
QUE 99 158	31.0	ENSTATITE METEORITE UNG	C	C		0-1
QUE 99 799	8.3	EUCRITE (BRECCIATED)	B	B/C		23-54
BTN 00 300	124.6	EUCRITE (UNBRECCIATED)	A	A		28-49
MET 00 423	79.4	HOWARDITE	A/B	A/B		20-53
MET 00 427	18.6	HOWARDITE	B	A/B		14-41
		Carbonaceous Chondrites				
QUE 99 113	0.6	CM2 CHONDRITE	A	A/B	2-13	2-12
MET 00 431	23.4	CM2 CHONDRITE	BE	C	0-31	7
MET 00 432	38.9	CM2 CHONDRITE	B	C	0-1	
MET 00 433	10.9	CM2 CHONDRITE	BE	C	0-8	
MET 00 434	6.1	CM2 CHONDRITE	BE	C	0-6	3
MET 00 435	2.4	CM2 CHONDRITE	BE	C	1-21	0-2
QUE 99 177	43.6	CR2 CHONDRITE	BE	B	1-31	1-7
MET 00 426	31.3	CR2 CHONDRITE	B	B/C	1-32	1-4
		Irons				
DRP 00 200	10000.0	IRON-IIAB	B	A		
DRP 00 201	2689.4	IRON-IIAB	B	A		
MET 00 400	4583.8	IRON-IIIAB	B	A		
MET 00 401	205.1	IRON-IIIAB	B	A		
MET 00 402	82.6	IRON-IIIAB	B	A		
MET 00 403	58.5	IRON-IIIAB	B	A		
MET 00 404	20.7	IRON-IIIAB	B	A		
MET 00 405	17.0	IRON-IIIAB	B	A		
MET 00 406	16.1	IRON-IIIAB	B	A		
MET 00 407	5.4	IRON-IIIAB	B	A		
MET 00 408	18.1	IRON-IIIAB	B	A		
MET 00 409	14.0	IRON-IIIAB	B	A		
MET 00 410	3.0	IRON-IIIAB	B	A		
MET 00 411	3.2	IRON-IIIAB	B	A		
MET 00 412	8.7	IRON-IIIAB	B	A		
MET 00 413	3.8	IRON-IIIAB	B	A		
MET 00 414	4.8	IRON-IIIAB	B	A		
MET 00 415	5.2	IRON-IIIAB	B	A		

Sample Number	Weight (g)	Classification	Weathering	Fracturing	% Fa	%Fs
		Irons				
MET 00 416	4.4	IRON-IIIAB	B	A		
MET 00 417	7.8	IRON-IIIAB	B	A		
MET 00 418	4.8	IRON-IIIAB	B	A		
MET 00 419	9.0	IRON-IIIAB	B	A		
MET 00 420	6.3	IRON-IIIAB	B	A		
MET 00 421	6.7	IRON-IIIAB	B	A		
MET 00 859	33.9	IRON-IIIAB	B	A		
MET 00 428	45.8	IRON UNGROUPED	B	A		

Table 3

Tentative Pairings for New Specimens

Table 3 summarizes possible pairings of the new specimens with each other and with previously classified specimens based on descriptive data in this newsletter issue. Readers who desire a more comprehensive review of the meteorite pairings in the U.S. Antarctic collection should refer to the compilation provided by Dr. E. R. D. Scott as published in issue 9(2) (June 1986). Possible pairings were updated in *Meteoritical Bulletins* No. 76 (*Meteoritics* 29, 100-143), No. 79 (*Meteoritics and Planetary Science* 31, A161-174), No. 82 (*Meteoritics and Planetary Science* 33, A221-A239), No. 83 (*Meteoritics and Planetary Science* 34, A169-A186), and No. 84 (*Meteoritics and Planetary Science* 35, A199-A225).

CHONDRITE UNGROUPED

QUE 99309, QUE 94627 with QUE 94411

ENSTATITE METEORITE UNGROUPED

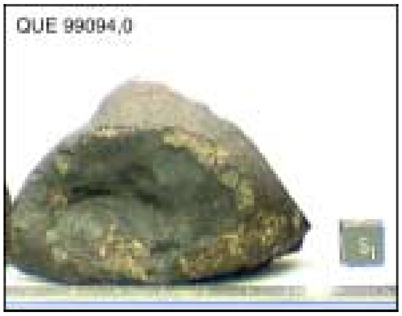
QUE 99157, QUE 99158 with QUE 99122

IRONS

DRP 00201; DRP 00200 with DRPA 78001

MET 00401; MET 00402; MET 00 403; MET 00404;
MET 00405; MET 00406; MET 00407; MET 00 408;
MET 00 409; MET 00410; MET 00411; MET 00412;
MET 00413; MET 00414; MET 00415; MET 00416;
MET 00417; MET 00418; MET 00419; MET 00420;
MET 00421; MET 00859 with MET 00400

Petrographic Descriptions



Sample No.:	**QUE 99094**
Location:	Queen Alexandra Range
Field No.:	11495
Dimensions (cm):	6.0 x 5.5 x 4.0
Weight (g):	329.3
Meteorite Type:	H5 Chondrite

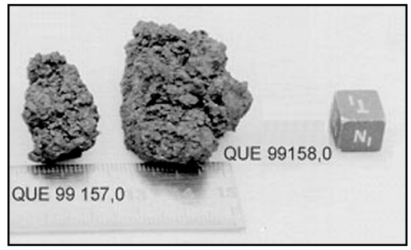
Macroscopic Description:
Kathleen McBride
Eighty-five percent of the meteorite's surface is covered with a smooth, brown-black fusion crust. The crust displays polygonal fractures and oxidation halos. The interior reveals a gray matrix with small gray chondrules and larger medium gray clasts, one of which measures 2 by 3 cm. The interior is moderately rusty with a high metal content.

Thin Section (, 2) Description:
Tim McCoy and Linda Welzenbach
This meteorite is a brecciated and shock-blackened H5 chondrite (Fa_{20}, Fs_{17}). Shock blackening is present in approximately half the section, and a sharp boundary divides the blackened portion from the unblackened portion. Veins of metal-sulfide melt are present throughout the meteorite.

Sample No.:	**QUE 99113**
Location:	Queen Alexandra Range
Field No.:	12111
Dimensions (cm):	1.5 x 1.0 x 0.5
Weight (g):	0.576
Meteorite Type:	CM2 Chondrite

Macroscopic Description:
Kathleen McBride
Dull, black fusion crust covers 20 percent of the exterior of this carbonaceous chondrite. The interior is a dark gray to black matrix with millimeter-sized white and light gray inclusions.

Thin Section (, 3) Description:
Tim McCoy and Linda Welzenbach
The section measures 8 by 5 mm. Vesicular fusion crust comprises ~80 percent of the section. Unaltered material is relatively rare. A few large chondrules are present at one end, although no unaltered matrix may remain. Olivine compositions are $Fa_{3\text{-}13}$, with most less than Fa_4, and orthopyroxene is $Fs_{2\text{-}13}$. The meteorite is a CM2 chondrite. It is possible that it was spalled off of a larger mass in flight, explaining the abundance of fusion crust



Sample No.:	**QUE 99122; QUE 99157; QUE 99158**
Location:	Queen Alexandra Range
Field No.:	11613; 11600; 11641
Dimensions (cm):	3.0 x 2.0 x 1.5; 3.0 x 1.25 x 1.5; 4.0 x 2.5 x 2.0
Weight (g):	19.936; 10.67; 31.012
Meteorite Type:	Enstatite Meteorite Ungrouped

Macroscopic Description:
Kathleen McBride
Ten percent of the exteriors of these meteorites is covered with patchy brown-black fusion crust. The interiors reveal rusty crystalline material that crumbles easily. These meteorites are too rusty to allow observation of any visible inclusions.

Thin Section (, 2) Description:
Tim McCoy and Linda Welzenbach
These meteorites are so similar that a single description suffices. The section consists of millimeter-sized enstatite grains ($Fs_{0\text{-}1}$), SiO_2, zoned plagioclase ($An_{7\text{-}31}$), potassium feldspar, metal, troilite, daubreelite, alabandite, and schreibersite. The latter phases often occur as rounded enclaves in the enstatite. These meteorites are paired with the QUE 99059/94204/97348/97289 grouping. Unlike the earlier members, which contained either plagioclase or SiO_2, these three contain both phases. These meteorites are unusual aubrites or enstatite chondrite impact melt rocks.

Sample No.: **QUE 99134**
Location: Queen Alexandra Range
Field No.: 11656
Dimensions (cm): 0.5 x 0.5 x 0.25
Weight (g): 0.387
Meteorite Type: Metal

Macroscopic Description:
Kathleen McBride
The exterior is vesicular and covered completely with brown-black fusion crust. The interior has a high metal content with some white granular minerals and some black, spongy material.

Thin Section (, 5) Description:
Tim McCoy, Linda Welzenbach, and Gretchen Benedix
The section measures 5 by 3 mm and is more than 95 percent metal. The metal is fairly uniform in composition (~23 percent Ni) and appears to be a fine plessitic structure heat altered to α_2. Other phases include troilite, chromite, olivine (Fa_{25}), and orthopyroxene (Fs_{23}). The meteorite may be metal from an L chondrite that was heat-altered during atmospheric entry.

Sample No.: **QUE 99145**
Location: Queen Alexandra Range
Field No.: 11458
Dimensions (cm): 1.5 x 1.0 x 0.75
Weight (g): 2.034
Meteorite Type: L5 Chondrite

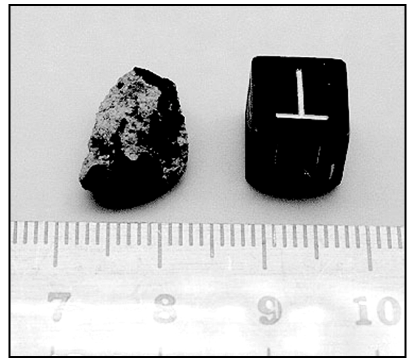
Macroscopic Description:
Kathleen McBride
Ninety percent of the exterior has dull brown-black fusion crust that is rusty in some areas. The interior is black with rusty areas.

Thin Section (, 2) Description:
Tim McCoy and Linda Welzenbach
This meteorite is a heavily shocked L5 chondrite (Fa_{24}, Fs_{20}). Shock blackening occurs throughout the meteorite with finely disseminated metal-sulfide blebs and veins. In addition, a millimeter-wide shock vein crosscuts the section.

Sample No.: **QUE 99177**
Location: Queen Alexandra Range
Field No.: 11631
Dimensions (cm): 4.0 x 3.0 x 2.0
Weight (g): 43.555
Meteorite Type: CR2 Chondrite

Macroscopic Description:
Kathleen McBride
The exterior is completely covered with weathered brown-black fusion crust exhibiting polygonal fractures and evaporites. The interior is a chocolate brown, soft matrix with rust and cream-colored chondrules ranging in size from 1 to 3 mm.

Thin Section (, 4) Description:
Tim McCoy and Linda Welzenbach
The section exhibits well-defined, metal-rich chondrules up to 2 mm in diameter in a dark matrix of FeO-rich phyllosilicate and metal. Polysynthetically twinned pyroxene is abundant. Silicates are unequilibrated; olivines range from $Fa_{1-31,}$ with most Fa_{0-2}; and pyroxenes range from $Fs_{1-7}Wo_{1-5}$. The meteorite is probably a CR2 chondrite.



Sample No.: **QUE 99231**
Location: Queen Alexandra Range
Field No.: 11649
Dimensions (cm): 1.5 x 1.0 x 0.75
Weight (g): 1.497
Meteorite Type: Diogenite

Macroscopic Description:
Kathleen McBride
Twenty-five percent of the exterior surface is covered with thin, black, shiny fusion crust. This achondrite's interior has an off-white, opaque crystalline matrix with ~1 mm black and green minerals.

Thin Section (, 3) Description:
Tim McCoy and Linda Welzenbach
The section shows a groundmass of coarse (up to 2 mm) comminuted orthopyroxene with a composition of $Fs_{20}Wo_{1-2}$. The Fe/Mn ratio of the pyroxene is ~30. The section exhibits a slight granoblastic texture. The meteorite is a diogenite.

Sample No.: **QUE 99309**
Location: Queen Alexandra Range
Field No.: 12177
Dimensions (cm): 1.0 x 0.75 x 0.5
Weight (g): 1.747
Meteorite Type: Chondrite Ungrouped

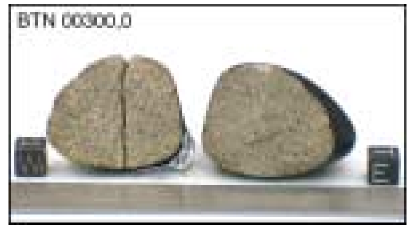
Macroscopic Description:
Kathleen McBride
One hundred percent of the exterior is covered with brown-black fusion crust. The interior is rusty brown and moderately hard.

Thin Section (, 2) Description:
Tim McCoy and Linda Welzenbach
The section consists of 70 to 80 percent round, elongate, and irregular metal particles typically 100 to 200 microns in diameter but reaching 1 mm. These particles are separated by terrestrial hydrated iron oxides. Chondrules occupy 20 to 30 percent of the rock and occur in similar shapes and sizes as metal. They are fine grained and dominated by barred, microporphyritic, and cryptocrystalline textures. Silicates are iron poor (Fa_{3-4}, Fs_1). The meteorite is similar in many respects to QUE 94411 and may be paired with it, although it was recovered more than 5 km from QUE 94411.

Sample No.: **QUE 99799**
Location: Queen Alexandra Range
Field No.: 12184
Dimensions (cm): 2.5 x 2.0 x 1.25
Weight (g): 8.298
Meteorite Type: Eucrite (Brecciated)

Macroscopic Description:
Kathleen McBride
Approximately 40 percent of this achondrite's exterior has a shiny, black fusion crust with some dull and weathered patches. The interior is white matrix with long, thin, black minerals. The meteorite looks shocked. A broken, weathered face has small, black globs that resemble fusion crust.

Thin Section (, 2) Description:
Tim McCoy and Linda Welzenbach
The section exhibits a brecciated texture dominated by equant pyroxenes ~200 microns in diameter and plagioclase laths reaching 0.5 mm in length. Pyroxene is finely exsolved with compositions ranging from $Fs_{23}Wo_{40}$ to $Fs_{54}Wo_2$ as well as intermediate compositions. The Fe/Mn ratio of the pyroxene is ~28. Plagioclase is $An_{80}Or_1$. The meteorite is a brecciated eucrite.



Sample No.: **BTN 00300**
Location: Bates Nunataks
Field No.: 12056
Dimensions (cm): 5.0 x 3.5 x 4.0
Weight (g): 124.563
Meteorite Type: Eucrite

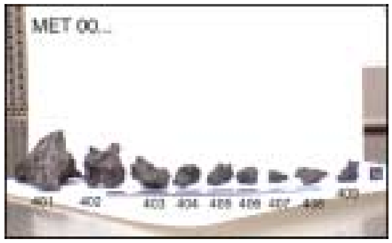
Macroscopic Description:
Kathleen McBride
The exterior is 100 percent covered with fusion crust. It has no chips or cracks and looks as though it fell to Earth yesterday. The fusion crust is black and glassy and has a ropy texture. The interior has a sandy texture and is tan in color, similar to sandstone. A binocular microscope shows dense, fine-grained clear yellow (citrine-colored) and root-beer-colored crystals. There are some black mineral grains, also. This meteorite was much more dense and difficult to break than most similar-looking stones.

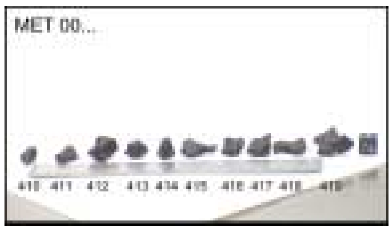
Thin Section (, 2) Description:
Tim McCoy and Linda Welzenbach
The meteorite exhibits an unbrecciated, fine-grained (~200 micron average grain size) structure of pyroxene and feldspar. Pyroxenes are finely exsolved with lamellae from 1 to 5 microns and a range of compositions from $Fs_{28}Wo_{35}$ to $Fs_{49}Wo_7$ as well as a range of intermediate composition. Plagioclase is $An_{87}Or_{0.5}$. The Fe/Mn ratio of the pyroxene is ~29. The meteorite is a eucrite.

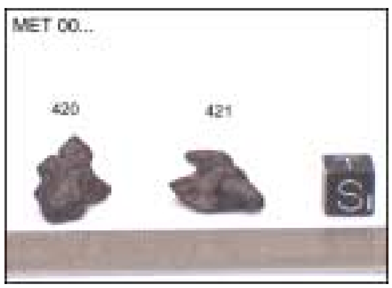
Sample No.:	**DRP 00200;** **DRP 00201**
Location:	Derrick Peak
Field No.:	12000; 12299
Dimensions (cm):	24.0 x 10.0 x 12.5; 14.0 x 10.0 x 8.0
Weight (g):	10,000.0; 2689.4
Meteorite Type:	Iron-IIAB

Macroscopic Description:
Tim McCoy
Each of these two masses exhibits a shiny brown surface and a highly corroded and discolored surface where it was in contact with the soil on Derrick Peak. The upper surface is highly pitted. The larger of the two masses exhibits prominent linear protrusions of resistant schreibersite crystals in depressions formed by severe terrestrial weathering and removal of the original surface. These depressions are aligned, probably reflecting alignment of the resistant schreibersite.

Microscopic Description:
Tim McCoy
A cut surface shows that these are typical members of the Derrick Peak iron shower (Clarke, *Meteoritics* 17, 129). Only a thin layer of corrosion is found on the surface, and neither fusion crust nor heat-altered zone is found. Structurally, they are coarsest octahedrites with large areas of swathing kamacite enclosing elongate, skeletal schreibersite crystals and centimeter-sized round troilite inclusions. Like other Derrick Peak irons, they are certainly members of group IIAB.







Sample No.:
MET 00400; MET 00401; MET 00402; MET 00403; MET 00404; MET 00405; MET 00406; MET 00407; MET 00408; MET 00409; MET 00410; MET 00411; MET 00412; MET 00413; MET 00414; MET 00415; MET 00416; MET 00417; MET 00418; MET 00419; MET 00420; MET 00421; MET 00859

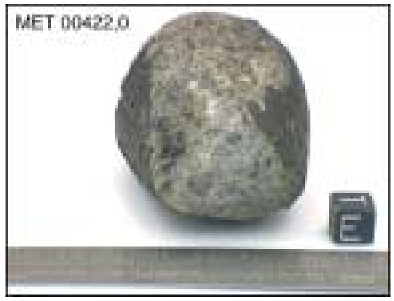
Location: Meteorite Hills
Field No.: 12293; 13464; 13465; 13132; 13449; 12214; 12352; 12229; 13492; 12263; 12297; 12273; 13788; 12285; 12277; 12271; 13340; 12260; 12237; 12221; 12256; 12098
Dimensions (cm): 17.5x11.0x7.0; 6.0x4.5x3.0; 4.5x3.0x3.0; 5.0x2.5x1.5; 3.0x1.5x1.0; 2.5x1.5x1.0; 2.5x1.5x1.0; 1.5x1.5x1.0; 4.0x2.0x0.75; 3.0x1.5x1.0; 1.5x1.0x0.75; 1.5x1.0x0.75; 2.5x0.75x1.5; 1.0x1.0x1.0; 1.5x1.0x1.0; 2.0x1.5x0.75; 2.0x1.0x0.75; 2.0x1.0x0.75; 2.0x1.5x1.0; 2.5x1.0x0.75; 2.5x1.25x0.75; 2.5x1.5x0.5; 3.0x2.5x1.5
Weight (g): 4583.8; 205.124; 82.595; 58.533; 20.675; 17.048; 16.128; 5.421; 18.088; 14.023; 2.973; 3.231; 8.664; 3.801; 4.84; 5.228; 4.374; 7.757; 4.841; 9.041; 6.298; 6.707; 33.85
Meteorite Type: Iron-IIIAB

Circumstances of Find:
John Schutt and Tim McCoy
These 23 meteorites range in mass from 4583.8 to 3.2 g. They occurred within 200 m on either side of a line 5.8 km long connecting the largest and smallest masses. Although larger masses tended to lie at one end and smaller masses at the other, the distribution was imperfect, and a mixed-mass clump was found in the center. The lineation of the distribution is not a result of either ice exposure or search strategy, as a much larger, rectangular area of blue ice was exposed and searched, and meteorites were recovered throughout this larger area. The lineation may suggest a relatively recent fall.

Macroscopic Description:
Tim McCoy
MET 00400, the largest of the masses at 4583.8 g, has an upper regmaglypt-covered surface with a shiny brown coating. A prominent peak is formed by the intersection of several regmaglypts. The lower surface appears to be an earlier generation of fusion crust, with much shallower and larger depressions and a brown, matte finish. The other masses, ranging from 3.2 to 205.1 g, are irregularly shaped with a shiny brown fusion crust similar to the upper surface of MET 00400. Smaller regmaglypts and depressions are common. Rare knobby surfaces are likely weathered fusion crust. Macroscopic similarities strongly support the pairing of these 23 meteorites. Slices were removed for examination from MET 00400 (4583.8 g), 00401 (205.1 g), 00402 (82.6 g), 00403 (58.5 g) and 00412

(8.7 g). These masses were chosen to sample the ranges of masses and locations within the distribution. MET 00400 and 00412 were separated by 5.3 km.

Microscopic Description:
Tim McCoy
All 5 meteorites are essentially identical (further supporting a pairing for all 23 meteorites), and a single description will suffice. The surfaces are dominantly covered by corrosion products up to ~200 microns in thickness. Corrosion does not penetrate into the interiors of these masses. Fusion crust is present in small patches, particularly in recesses along the surface of the meteorite. An α_2 structure of atmospheric origin is present in many places along all masses and extends up to 1 mm into the center of the meteorite. The meteorites exhibit a medium octahedrite structure with original band widths of 1–1.5 mm and typically L/W of 15–20. Each mass exhibits a single orientation of the Widmanstatten pattern, suggesting the formation of each (and perhaps all) from a single austenite crystal. A large, polycrystalline troilite nodule (17 cm in diameter) is present in MET 00400. The interior structure is extensively heat-altered and dominated by recrystallized kamacite. Dimensions of recrystallized grains are typically 100–500 microns. The meteorite is a preterrestrially heat-altered medium octahedrite. It may be a member of group IIIAB and is similar to heat-altered members of that group (e.g., Joel's Iron; Buchwald, 1975).



Sample No.:	**MET 00422**
Location:	Meteorite Hills
Field No.:	13466
Dimensions (cm):	7.0 x 4.0 x 4.0
Weight (g):	201.466
Meteorite Type:	Diogenite

Macroscopic Description:
Kathleen McBride
Forty percent of the exterior of this meteorite is covered with a chocolate brown fusion crust. This crust is patchy and displays polygonal fractures. The exposed interior is gray and tan and has dark, crystalline clasts. The interior is mostly gray matrix with some areas of tan grains. This rock contains numerous euhedral clasts of various colors—black, green, white, and yellow—and is moderately soft.

Thin Section (, 2) Description:
Tim McCoy and Linda Welzenbach
The section shows a groundmass of highly comminuted pyroxene with the largest grain reaching 1.8 mm. Orthopyroxene has a composition of $Fs_{22}Wo_{1-2}$. The Fe/Mn ratio of the pyroxene is ~30. The meteorite is a diogenite.

Sample No.:	**MET 00423**
Location:	Meteorite Hills
Field No.:	13556
Dimensions (cm):	6.0 x 4.0 x 3.5
Weight (g):	79.375
Meteorite Type:	Howardite

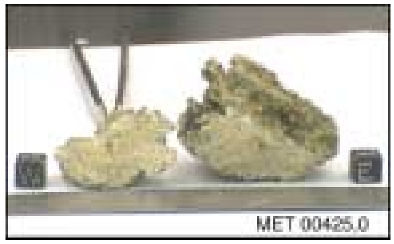
Macroscopic Description:
Kathleen McBride
Approximately forty percent of the exterior surface is covered by dark brown fusion crust that has shiny, black patches. The surface contains vugs, or areas where material has been plucked or weathered out. The fine-grained, medium gray matrix has numerous euhedral clasts in various colors—gray, black, tan, and white.

Thin Section (, 2) Description:
Tim McCoy and Linda Welzenbach
The section shows a groundmass of comminuted pyroxene and plagioclase (up to 1 mm) with medium- to coarse-grained basaltic clasts reaching 3 mm. Pyroxene includes orthopyroxene ($Fs_{20-53}Wo_{1-3}$) and exsolved pyroxenes of $Fs_{49}Wo_5$ to $Fs_{22}Wo_{38}$. The Fe/Mn ratio is ~30. Plagioclase is $An_{78-93}Or_{0-1}$. The meteorite is a howardite.

Sample No.: **MET 00424**
Location: Meteorite Hills
Field No.: 13432
Dimensions (cm): 5.0 x 3.5 x 3.5
Weight (g): 98.873
Meteorite Type: Diogenite

Macroscopic Description:
Kathleen McBride
This achondrite's exterior has dull brown-black fusion crust over 90 percent of the surface. The fusion crust has a pearl-like luster and exhibits polygonal fracturing. The interior is composed of crystalline mineral grains that are white to light gray in color. Most of this material is now rust. Accessory minerals are black and less than 2 mm in diameter. Millimeter-sized pale green and brown grains are also visible.

Thin Section (, 2; , 6) Description:
Tim McCoy and Linda Welzenbach
The meteorite exhibits a coarsely brecciated structure with clasts several millimeters in size. The individual clasts have millimeter-sized grains with irregular, intergrown grain boundaries. A single olivine grain was noted. Orthopyroxene is homogeneous ($Fs_{27}Wo_1$), and olivine is Fa_{29}. A large (greater than 5 mm) troilite nodule with a highly distorted polycrystalline texture is also present. The meteorite is a diogenite.



Sample No.: **MET 00425**
Location: Meteorite Hills
Field No.: 13562
Dimensions (cm): 5.5 x 5.5 x 3.5
Weight (g): 118.302
Meteorite Type: Diogenite

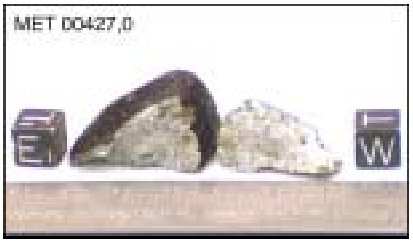
Macroscopic Description:
Kathleen McBride
Brown-black fusion crust makes up less than 5 percent of the surface area of this meteorite. The exposed interior is yellow-green and has large vugs, or cavities where material has weathered away or has been plucked. The interior is a very fine-grained, cream-colored matrix loaded with pale green millimeter-sized euhedral crystals, small black specks (less than 1 mm), and millimeter-sized rusty clasts that have stained the surrounding matrix. This meteorite is soft and moderately friable.

Thin Section (, 2) Description:
Tim McCoy and Linda Welzenbach
The section shows a groundmass of coarse comminuted pyroxene that has polycrystalline fragments with grain sizes up to 2.5 mm. Orthopyroxene has a composition of $Fs_{15}Wo_1$. The Fe/Mn ratio of the pyroxene is ~30. Stringers of SiO_2 were found in igneous contact with orthopyroxene. The meteorite is a diogenite.

Sample No.: **MET 00426**
Location: Meteorite Hills
Field No.: 13708
Dimensions (cm): 3.5 x 3.0 x 2.0
Weight (g): 31.326
Meteorite Type: CR2 Chondrite

Macroscopic Description:
Kathleen McBride
Mostly weathered fusion crust covers about 40 percent of the exterior surface of this meteorite. The crust resembles an overcooked brownie. The rest of the exposed surface is dark brown and looks like an amalgamation of melted brown chondrules. The interior of this carbonaceous chondrite is black and contains irregular-shaped clasts and numerous white and rust-colored chondrules 1 to 2 mm in size. The meteorite was easily broken and is very friable.

Thin Section (, 2) Description:
Tim McCoy and Linda Welzenbach
The section exhibits well-defined, metal-rich chondrules up to 3 mm and metal spheres up to 1 mm in a dark matrix of FeO-rich phyllosilicate. Polysynthetically twinned pyroxene is abundant. Silicates are unequilibrated; olivines range from Fa_{1-32}, with most Fa_{0-2}; and pyroxenes range from $Fs_{1-4}Wo_{0-1}$. The meteorite is probably a CR2 chondrite.



Sample No.: **MET 00427**
Location: Meteorite Hills
Field No.: 13749
Dimensions (cm): 3.5 x 2.5 x 2.0
Weight (g): 18.558
Meteorite Type: Howardite

Macroscopic Description:
Kathleen McBride
Chocolate brown fusion crust covers 90 percent of this meteorite. The crust has a slight sheen to it and has polygonal fractures. The interior consists of a gray matrix with small inclusions of various colors. This meteorite is soft and moderately friable.

Thin Section (, 2) Description:
Tim McCoy and Linda Welzenbach
The section shows a groundmass of comminuted pyroxene and plagioclase (up to 1 mm) with large (6 mm) coarse-grained diogenite fragments and a single millimeter-sized impact melt spherule. Pyroxene includes orthopyroxene ($Fs_{40}Wo_{1-2}$) and exsolved pyroxenes of $Fs_{37}Wo_4$ to $Fs_{15}Wo_{38}$. The Fe/Mn ratio is ~30. Plagioclase is $An_{76-93}Or_{0-1}$. The meteorite is a howardite.

Sample No.: **MET 00428**
Location: Meteorite Hills
Field No.: 13040
Dimensions (cm): 3.5 x 2.5 x 1.5
Weight (g): 45.774
Meteorite Type: Iron Ungrouped

Macroscopic Description:
Kathleen McBride and Tim McCoy
This 45.8-g, ellipsoidal specimen has a frothy exterior. One end of the specimen exhibits a rounded depression. The end of the mass appears as if it may have been torn from another piece during atmospheric passage.

Microscopic Description:
Tim McCoy
The section is dominated by Fe, Ni metal with 10–20 vol.% of rounded, elongate and ellipsoidal troilite inclusions that range in size from 200 microns to 2 mm in maximum dimension, with most less than 1 mm. The section is bounded by an α_2 structure produced during atmospheric heating that extends up to 2 mm into the interior of the meteorite. Rare fusion crust is present. The frothy exterior resulted from a combination of atmospheric ablation and terrestrial weathering of the troilite inclusions. The troilite inclusions exhibit multiple twinning from deformation. No silicate or chromite inclusions are observed. Swathing kamacite surrounds the troilite inclusions. In areas of relatively few troilite inclusions, a weak Widmanstatten pattern is observed, with very thin kamacite lamellae (100-120 microns wide). Kamacite exhibits numerous Neumann bands, and these bands are subsequently bent or, in many cases, sheared by subsequent microfaults. Large areas between kamacite bands are dominated by net or finger plessite. The classification of this meteorite is uncertain. Most other troilite-rich meteorites (e.g., Mundrabilla, LEW 86211, Soroti) differ significantly. The closest relative may be the fine octahedrite Mont Dieu, which is a member of group IIE.

Sample No.: **MET 00431; MET 00433; MET 00434; MET 00435**
Location: Meteorite Hills
Field No.: 13569; 13755; 13765; 13791
Dimensions (cm): 4.5 x 3.5 x 1.0; 2.5 x 3.5 x 1.0; 3.0 x 2.0 x 1.0; 2.0 x 1.5 x 0.5
Weight (g): 23.368; 10.897; 6.125; 2.385
Meteorite Type: CM2 Chondrite

Macroscopic Description:
Kathleen McBride
The exteriors of these meteorites are black. The interiors are platy and black with evaporites and tiny, round, white chondrules.

Thin Section (, 2) Description:
Tim McCoy and Linda Welzenbach
The sections consist of a few small chondrules (up to 1 mm), mineral grains, and CAI's set in a black matrix. Olivine compositions are $Fa_{0-31,}$ with most less than Fa_2, and orthopyroxene is Fs_{0-7}. In thin sections, these meteorites exhibit fracturing and flattening of chondrules along a preferred orientation. The matrix is an iron-rich serpentine that occurs in spheres ~200 microns in diameter, and each sphere exhibits a fibrous internal texture. Parting of the meteorites occurs between these spheres. The meteorites are CM2 chondrites.

Sample No.: **MET 00432**
Location: Meteorite Hills
Field No.: 13407
Dimensions (cm): 4.5 x 3.5 x 3.0
Weight (g): 38.90
Meteorite Type: CM2 Chondrite

Macroscopic Description:
Kathleen McBride
This irregularly shaped meteorite has a black exterior that is friable and crumbles easily. The black, chalk-like interior has small (less than 1 mm) white chondrules.

Thin Section (, 2) Description:
Tim McCoy and Linda Welzenbach
The sections consist of a few small chondrules (up to 0.5 mm), mineral grains, and CAI's set in a matrix of Fe-rich serpentine. Matrix, whole chondrules, and chondrule mesostasis have been aqueously altered to a degree similar to that of Nogoya. Olivine is Fa_{0-1}. The meteorite is a CM2 chondrite.

Sample No.: **MET 00436**
Location: Meteorite Hills
Field No.: 12247
Dimensions (cm): 14.0 x 7.5 x 10.0
Weight (g): 1765.600
Meteorite Type: Diogenite

Macroscopic Description:
Kathleen McBride
Fifty percent of the exterior is covered with a patchy brown-black fusion crust with polygonal fractures. The exposed interior is tan to yellow-orange (or Dijon mustard) in color. There are several penetrating fractures. The rock seems to be rather lightweight for its size. The cream-colored interior matrix has black crystalline clasts (less than 1 mm) that are the most prevalent features of this meteorite. Less frequently occurring inclusions are transparent subhedral clasts and elongated, flat grains that are light brown in color. This meteorite appears to be weathered and friable except on the most interior areas, away from fractures.

Thin Section (, 2) Description:
Tim McCoy and Linda Welzenbach
The section exhibits coarse (greater than 5 mm) individual pyroxene grains, polycrystalline fragments, and comminuted groundmass grain of a uniform $Fs_{26}Wo_{1-2}$ composition. The Fe/Mn ratio of the pyroxene is ~30. Small diopside grains were noted optically, as were metal, sulfide, and millimeter-sized chromite grains. The meteorite is a diogenite.

Table 4

Natural Thermoluminescence (NTL) Data for Antarctic Meteorites

Mary Cummings, Paul H. Benoit and Derek W.G. Sears
Arkansas-Oklahoma Center for Space and Planetary Sciences
University of Arkansas
Fayetteville, AR 72701 USA

The measurement and data reduction methods were described by Hasan *et al.* (1987, *Proc. 17th LPSC*, E703-E709; 1989, *LPSC XX*, 383-384). For meteorites whose TL lies between 5 and 100 krad, the natural TL is related primarily to terrestrial history. Samples with NTL <5 krad have TL levels below that which can reasonably be ascribed to long terrestrial ages. Such meteorites have had their TL lowered by heating within the last million years or so by close solar passage, shock heating, or atmospheric entry, exacerbated in the case of some achondrites by anomalous fading. We suggest meteorites with NTL >100 krad are candidates for unusual orbital/thermal histories (Benoit and Sears, 1993, EPSL, 120, 463-471).

Sample	Class	Natural TL [krad at 250 °C]
GEO 99101	H4	47.0 ± 1.0
EET 99412	H5	43.0 ± 1.0
EET 99413	H5	10.9 ± 0.3
EET 99414	H5	61.0 ± 1.0
EET 99416	H5	9.9 ± 0.1
EET 99420	H5	1.2 ± 0.1
EET 99422	H5	97.7 ± 0.1
EET 99423	H5	1.5 ± 0.1
GEO 99100	H5	0.4 ± 0.1
MIL 99300	H5	27.1 ± 0.3
MIL 99303	H5	29.6 ± 0.5
MIL 99304	H5	0.5 ± 0.1
QUE 99003	H5	49.0 ± 1.0
QUE 99004	H5	70.2 ± 0.1
QUE 99008	H5	24.8 ± 0.1
QUE 99009	H5	64.0 ± 2.0
QUE 99014	H5	23.5 ± 0.1
QUE 99027	H5	60.6 ± 0.6
ALH 99505	H6	35.4 ± 0.7
EET 99410	H6	6.5 ± 0.1
EET 99411	H6	20.2 ± 0.3
QUE 99002	H6	34.5 ± 0.7
ALH 99506	L5	113.0 ± 0.5
EET 99424	L5	1.5 ± 0.1
MIL 99306	L5	51.2 ± 0.1
MIL 99309	L5	86.6 ± 0.8
MIL 99310	L5	38.0 ± 0.4
MIL 99319	L5	40.5 ± 0.4
MIL 99320	L5	42.8 ± 0.3
MIL 99323	L5	29.8 ± 0.5

Sample	Class	Natural TL [krad at 250 °C]
QUE 99010	L5	112.0 ± 0.5
QUE 99029	L5	7.2 ± 2.0
EET 99409	L6	0.6 ± 0.1
GEO 99129	L6	0.6 ± 0.1
MIL 99305	L6	14.0 ± 0.1
MIL 99318	L6	8.3 ± 0.1
QUE 99028	L6	101.0 ± 1.0
MIL 99301	LL6	65.8 ± 0.1
MIL 99308	LL6	0.5 ± 0.1
EET 99400	HOW	6.4 ± 0.5

The quoted uncertainties are the standard deviations shown by replicate measurements on a single aliquot.

COMMENTS: The following comments are based on natural TL data, TL sensitivity, the shape of the induced TL glow curve, classifications, and sample descriptions.

QUE 99029 and EET 99424 have very low TL sensitivity compared with other equilibrated ordinary chondrites and may be extensively shocked.

Pairings suggested by TL data:
H5: QUE 99008 with QUE 99014
L5: MIL 99319 with MIL 99320

Sample Request Guidelines

All sample requests should be made (**preferably via e-mail—hard copies are not necessary**) to

E-mail:
cecilia.e.satterwhite1@jsc.nasa.gov

Please type "MWG request" in the subject line.

If necessary, hard copies can be sent to

Secretary, Meteorite Working Group
NASA Johnson Space Center
ST
Houston, TX 77058 USA
FAX: (281) 483-5347

Requests that are received by the MWG Secretary before **September 28, 2001** will be reviewed at the MWG meeting **October 5-6, 2001** in Washington, D.C. Requests that are received after the **September 28** deadline may be delayed for review until the MWG meets again in the spring of 2002. **Please submit your requests on time**. Questions about sample requests may be directed in writing to the MWG Secretary at the above address or to the curator via phone, fax, or e-mail.

The MWG meets twice a year—each spring in Houston, Texas and each fall in Washington, D.C. The deadline for submitting a request is generally 3 weeks before the scheduled meeting.

Requests for samples are welcomed from research scientists of all countries, regardless of their current state of funding for meteorite studies. Graduate student requests should be accompanied by an e-mail (or an initialed or countersigned hard copy) from a supervising scientist to confirm access to facilities for analysis. All sample requests will be reviewed in a timely manner. Requests that do not meet the guidelines for JSC curatorial allocation will be reviewed by the MWG, a peer review committee that meets twice a year to guide the collection, curation, allocation, and distribution of the U.S. collection of Antarctic meteorites. Issuance of samples does not imply a commitment by any agency to fund the proposed research. As a matter of policy, U.S. Antarctic meteorites are the property of the National Science Foundation, and all allocations are subject to recall.

Each request should accurately refer to meteorite samples by their respective identification numbers and should provide detailed scientific justification for proposed research. Specific requirements for samples, such as sizes or weights, particular locations (if applicable) within individual specimens, or special handling or shipping procedures should be explained in each request. Some meteorites are small, of rare type, or are considered special because of unusual properties. Therefore, it is very important that all requests specify both the optimum amount of material needed for the study and the minimum amount of material that can be used. Requests for thin sections that will be used in destructive procedures such as ion probe, etch, or repolishing must be stated explicitly. Consortium requests should be accompanied by confirming e-mail from the lead member of each group in the consortium or initialed or countersigned hard copies. In most cases, all necessary information should be condensed to a 500–1000 word message, although informative attachments (publications that explain rationale, flow diagrams for analyses, etc.) are welcome. **It is very helpful to include a table summarizing the request and listing each meteorite requested, the type of samples (e.g., interior chip or thin section) and the optimum and minimum masses needed.**

Samples from any meteorite that has been made available through announcement in any issue of the Antarctic Meteorite Newsletter can be requested. Many of the meteorites have also been described in five *Smithsonian Contributions to the Earth Sciences*: Nos. 23, 24, 26, 28, and 30. Tables containing all classified meteorites (as of February 2000) have been published in several issues of the Meteoritical Bulletin in *Meteoritics* 29, 100-143, and *Meteoritics and Planetary Science* 31, A161-A174; 33, A221-A239; 34, A169-A186; and 35, A199-A225. The most current listing is found online at <http://www-curator.jsc.nasa.gov /curator/antmet/us_clctn.htm>.

Antarctic Meteorite Laboratory Contacts

David Mittlefehldt	**Cecilia Satterwhite**
Acting Curator	***Lab Manager***
Mail code SR	Mail code ST
NASA Johnson Space Center	NASA Johnson Space Center
Houston, Texas 77058	Houston, Texas 77058
281-483-5043	281-483-6776
david.w.mittlefehldt1@jsc.nasa.gov	cecilia.e.satterwhite1@jsc.nasa.gov

FAX: 281-483-5347

Meteorites Online

Several meteorite Web sites provide information on meteorites from Antarctica and elsewhere. Some specialize in Martian meteorites and the possibility of life on Mars. Here is a general listing of Web sites we have found. We have not included sites focused on selling meteorites, though some of them contain general information. Please contribute information about other sites so that we can update the list.

JSC Curator, Antarctic meteorites	http://www-curator.jsc.nasa.gov/curator/antmet/antmet.htm
JSC Curator, Martian meteorites	http://www-curator.jsc.nasa.gov/curator/antmet/marsmets/contents.htm
JSC Curator, Mars Meteorite Compendium	http://www-curator.jsc.nasa.gov/curator/antmet/mmc/mmc.htm
Antarctic collection	http://www.cwru.edu/affil/ansmet
LPI Martian meteorites	http://cass.jsc.nasa.gov/lpi/meteorites/mars_meteorite.html
NIPR Antarctic meteorites	http://www.nipr.ac.jp/
BMNH general meteorites	http://www.nhm.ac.uk/mineralogy/collections/meteor.htm
UHI planetary science discoveries	http://www.soest.hawaii.edu/PSRdiscoveries
Meteoritical Society	http://www.uark.edu/studorg/metsoc
Meteorite! Magazine	http://www.meteor.co.nz
Geochemical Society	http://www.geochemsoc.org